

172 high walls around a central courtyard are all that it consists of, and some
712 of the Omani guns still remain in the towers. The fort was built in 1800 by the Ruler of Muscat, Sultan bin Ahmed, who in that year seized Bahrain from the Khalifah and sent his brother, Sayed Said, to govern the Islands they were soon expelled but later returned. The Muscatis remained in their fort for nine years, but after their expulsion in 1809 by the Khalifah-Saudi alliance the fort was left deserted.

Near Muharraq town is the fort of Abu Mahur, already mentioned in connection with the Portuguese map and named after one of the largest undersea springs in Bahrain, which is situated near it. The fort, which dominates the southern approach to Muharraq and Manama, was built on the island-peninsular of Abu Mahur by Shaikh Abdulla al-Khalifah, who ruled jointly with his brother Sulman, builder of the fort at Rifaa ash-Sharqi. In 1843 Shaikh Abdulla was expelled from Bahrain by his son Muhammad, who was also unable to enjoy a peaceful reign, for after a dispute with Qatar Muhammad was replaced as Ruler of Bahrain by his brother Ali and the British shelled the fort of Abu Mahur, which was destroyed with the exception of one tower. [744] More recently the remains of the fort and the island was given to the Baluchi retainers of the Khalifah, but in 1930 the Baluchis were given land elsewhere and the island was turned into a Quarantine Station. This is therefore a fort which visitors are not advised to visit.

THE QANATS

312 "Qanat" is the Arabic name for the underground water channels
172 which are found in many parts of Bahrain, particularly in the south-west of the island. Here, among others, is a long channel running inland from Sadad, another brings water to Karzarkan from the spring called Ijraiya, a mile and a half to the north, and a third channel runs from the spring of Malakiya to the village of the same name. These are but a few of the many channels in Bahrain.

312 These channels are present in great numbers in Persia and are also
171 found in eastern Saudi-Arabia and Syria. It is probable that those in Bahrain were first built by the Persians. It is stated in at least one history that they were the work of the Persian King Anushirvan who captured Bahrain from the Arabs in the fourth century A.D. They have often been mentioned by travellers to Bahrain and in a local history it is stated that during a war that took place in the eighth century between the people of Bahrain and an army sent by the Caliph, the Bahrainis made good use of these same channels by passing through them till they reached the rear of the enemy forces and then making a successful surprise attack.

312 The channels were built to prevent the wastage of water from evaporation
172 which would have occurred had the water been carried in surface channels. By this method the water is sheltered from the sun and its flow is not hindered by falls of sand or the movements of sand dunes. It seems that the channels were first built as open ditches and then roofed with slabs of sea rock, called feroush. The roofs of the channels are sloping and after construction they were covered with sand to the

CONCLUSIONS

161 The most striking fact which has emerged from the second census of Bahrain is that although there has been an increase in the total population of about 20% in nine years yet this increase is confined to Manamah and Muharraq alone, the growth of the population of Manamah being twice as much as in Muharraq. Even if the number of men who are working abroad is taken into consideration the lack of increase in the rural districts discloses an unsatisfactory state of affairs in the villages which was only revealed

165 by the census. During the preliminary registration, which in the case of the villages took about a fortnight, and the night of the census, the census staff recorded 43 deaths in a village population of about 31,500 (the Arab villages were not included in this total). In one small village with a population of 248 persons there were eight deaths in ten days and in every case the deaths were of very young children, yet no epidemic existed.

464 There is no unemployment in Bahrain and the cost of living in the villages is no higher than it was a few years ago. There is no reason to suppose that the lack of increase in the rural population is due to economic causes.

744 The people in the towns and in the villages which are near the towns make more use every year of the public health facilities which are provided by the Government. Cleanliness and sanitation have improved and the anti-malaria work which the Government has carried out has done much to reduce malaria, but few women patients come to the hospitals from distant villages, although today almost all the villages are on bus routes. From what information can be obtained, without vital statistics, it would appear that infant mortality rate in the villages is extremely high. It used to be equally high in the towns but conditions in this respect in the towns have much improved.

PUBLIC HEALTH

Report by Dr. J. D. Grant.

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During its first year of existence, the Public Health Service had its fair share of growing pains caused chiefly by Staff changes. A shortage of trained technical and clerical personnel and an apathy or lack of education on the part of local bodies and people in matters of hygiene and sanitation. On the other hand, the port and quarantine side functioned smoothly, anti-malaria control measures were extended to cover the whole Island except for a few villages in the southern end, and a Boys' School Medical Service was inaugurated.

Staff. Mr. L. J. Harvey, Public Health Inspector, resigned on the 1st March to rejoin the Anglo-Iranian Oil Company at Aden and was replaced by Mr. F. Burgin who arrived on the 2nd June.

The following new appointments were made:—

Dr. Ali Munus, School Medical Officer, 26th November.

Dr. P. P. Maitre, Port Health Officer, 22nd June.

Trained Personnel. The shortage of this class of labour was a constant problem, and to fill some of the gaps it was necessary to recruit from Pakistan and India. These sources will have to be tapped further until requirements can be met from Bahrain.

Hygiene and Sanitation. Sanitary measures were chiefly confined to the Municipal areas, and in each case the local Council was responsible for carrying out these duties, with the Public Health Authorities acting in an advisory capacity. This arrangement proved unsatisfactory, as for one reason or another, the Isaladiyas were very loath to carry out the suggestions offered and most reluctant to implement the recently drawn up Sanitary Bye-laws. At the end of the year it was decided that much stronger action was required and that Health Education by legislation would have to be resorted to where necessary; the Public Health Authorities were therefore furnished with summary powers to enforce sanitary measures.

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The absence of a proper sewage and drainage system continues to be one of the greatest stumbling blocks to any effort or progress in improving the standard of sanitation in Municipal areas. The present rapid rate of building adds daily to the problem and the stage has now been reached when it is imperative to change from the prevailing highly dangerous and obnoxious cesspool method of conservancy and drainage. The impending survey by a consultant Sanitary Engineer with this end in view is being looked forward to eagerly.

Regular inspections resulted in a slight improvement in the standard of cleanliness of restaurants, eating houses, coffee shops, bakeries, aerated water factories and other premises used for the preparation and sale of foodstuffs. In future, licences for these premises will be issued direct by the Public Health Department after they have been inspected and passed as satisfactory and those premises which, after due warning fail to reach the standard required will be closed down. The hawking of foodstuffs will not be permitted unless adequate precautions against contamination by dust and flies are taken and the general sanitary conditions under which this type of business is conducted are satisfactory.

The new fish, meat and vegetable and fruit markets at Qudabiya were opened during the year, but so far have not proved very popular. They set a very good standard with fly proofing, cement floors, washing and drainage facilities and adjacent rubbish receptacles and latrines. A similar type of building is under construction in Manama for the sale of fruit and vegetables. The other Manama markets and all the Muharraq ones are in such an insanitary state that their reconstruction on the above lines is most essential and should be carried out without further delay.

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The standard of domestic sanitation is poor. Dirt, disease and squalor reign in many houses causing much unnecessary sickness at considerable cost to hospital and medical services. Better and cleaner houses and less money spent on drugs and more on drains would be of greater value in the task of promoting health and preventing disease.

7 Apr 1954 A.D. 1953-1954 — Analyst

Anti-Malaria Control. Control measures were continued on the same lines as in former years linking up with the Oil Company's campaign of the East and West central areas, and in addition a system of residual spraying on a large scale was introduced and the area of activities extended to cover practically the whole of the Island. The maximum labour employed at any time consisted of 27 semi-skilled and 70 unskilled workers under two supervisors. 744 164

Malaria transmission is restricted to two periods, the first from March to June, and the second from October to January. Breeding, however, is perennial and the number of breeding places reported and treated was :—

	Anopheles.	Cules.	Anopheles and Cules.
Town Areas ..	188 ..	1,340 ..	129
Garden and Country Area ..	8,050 ..	40,617 ..	18,163
Total ..	8,238	41,957	18,292

Town breeding places are water storage containers, exposed sub-soil water, shallow wells, cesspools and faulty drains. The present building campaign is adding daily to the number in the form of cesspools and inadequate drainage. In the gardens and country areas, breeding occurs in badly maintained irrigation channels and drains, wells, borrow pits and stagnant pools resulting from an overflow.

Larvicidal measures consisted of oiling and suspensions to deal with water collections, weeding and canalising water channels and the use of larvivorous fish. A larvicidal oil containing Diesel 70 per cent., crude 20 per cent. and waste motor 10 per cent. with or without D.D.T. 1.5 per cent. was found to be most effective and economical. The measures employed against adult mosquitoes were fogging by Tifa machine, and residual spraying by Knapsack sprayers. Gammaxane P.520 and D.D.T. were the chief insecticides used.

The incidence of malaria has been on the decline for some years past and is no longer a major problem. As the disease is not notifiable, it is not possible to define its exact proportions, but a spleen count carried out amongst 4,556 schoolboys gave a rate of enlarged spleen of 3.5 per cent. with the following figures for the most malarious areas :—

School.	Total number of Boys.	Number of enlarged spleens.	Percentage.
Sitra ..	120 ..	29 ..	24.0
Khamis ..	281 ..	48 ..	15.0
East Rafaa ..	140 ..	21 ..	15.0
Tubli ..	60 ..	8 ..	13.0
West Rafaa ..	63 ..	8 ..	12.5
Karzakan ..	63 ..	6 ..	9.5

These figures show a decided improvement on those reported in a survey carried out some years ago when the average village spleen rate was much higher. The Bahrain Petroleum Medical Department reported a rate of 3.15 per cent. of malaria cases for the year with 0.4 per cent. occurring in the first transmission period and 2.75 per cent. for the second period. These cases were diagnosed on the presence of parasites in the blood and covered a group of 7,350 local employees from all over the Island.

Both these sets of statistics will be available in the future and will give an indication of the trend of the disease.

School Medical Service (Boys). This service was inaugurated in the early part of the year. The staff consisted of a Medical Officer and an Arab nursing orderly. The scope of the service was routine medical examination of all pupils, treatment of minor illnesses with the referring of the more serious cases to hospital, education in elementary hygiene and the supervision of school sanitation. 744 871

1 [A.D. 1952-53 - 1st]

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There are 19 Boys' Schools on the Islands with an attendance of 4,318 pupils located as follows :-

School	Number of Pupils
West Primary	666
East Primary	195
East Kindergarten	453
Secondary	165
Technical	54
Old Kindergarten	205
New Kindergarten	364
Primary	687
Samhij	96
Hadd	340
Budayia	167
Khamis	271
Tubli	62
Senad	20
Aali	68
Kazakan	86
West Rafaa	64
East Rafaa	136
Sitra	119
Total	4,318

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All these pupils were examined during the year and the results noting the defects and other relevant information recorded on an individual school medical card.

The most common defects were :-

Defect	Number cases	Percentage Town School	Country School
Trachoma and Conjunctivitis	1250	20.9	52.7
Defective vision	413	7.5	15.4
Enlarged tonsils	223	5.5	3.9
Enlarged spleens	182	1.4	12.3
Skin diseases	136	0.5	10.7
Corneal opacities	88	1.6	3.2
Squint	37	1.0	0.3

The number of defects was on the whole, much higher among boys attending country schools than boys at town schools and their rate of growth was slower between the ages of 11 and 16. (Fig. 1). A lower standard of living, malnutrition and poor sanitary conditions in the villages contribute towards this discrepancy but it is hoped that the extension of anti-malarial activities, the school medical service and, if possible, the provision of a school meal, will help to remedy this state of affairs in due course.

The measurement of the weight and height of all pupils was carried out and recorded graphically on each boy's school medical card. This procedure over a number of years should be of immense value in detecting disease and assessing health, as loss of weight, failure to gain, or cessation of growth may be early indications of such various conditions as tuberculosis, sub-acute rheumatism, malnutrition, chronic disease of an essential organ, etc. While every care was taken to ensure reasonable accuracy, the anthropometric technique employed was liable to a certain measure of error as it was not possible to provide at, or carry around to each school, a beam scale weighing machine, or a proper height measuring scale. In addition, it was often difficult to estimate the correct age, as births are not registered in Bahrain, and many children especially in towns, gain admission before the school entrance age of seven years, and are shown as being of that age. As a point of interest, comparative figures in respect of weights and heights between groups of English and Bahrain schoolboys are shown (Fig. 2) from which it will be seen that at all ages, English schoolboys are heavier and taller than Bahrain schoolboys.

The condition of school buildings varied, but in all cases overcrowding was common. The new schools are well built, lighted and ventilated and are provided with ample recreation space and adequate latrines and ablution facilities. Most of the others are reasonably good, but require improvements in lighting, ventilation, condition of floors and desks as the case may be. Samahij is, however, quite unsuitable and a new building is required. Some of the town schools are situated in congested areas and accordingly lack adequate playground space. All country schools must have good washing facilities and the pupils given routine baths. This would reduce their high incidence of disease resulting from dirt and uncleanness. 346 871 744

The service has been well received by the teaching staff and has been given their full co-operation and help.

Port and Quarantine. The number of people entering Bahrain, their place of entry and the number arriving without valid certificates of vaccination were recorded as follows:— 744 434

Number of arrivals.	Place of Entry.	Number without valid vaccination certificate.
67,172	Manama Jetty	9,292
22,107	Muharrag Airport	721
2,112	Muharrag Jetty	684
2,344	P. C. L. Jetty, Sitra	nil
111	Sitra Port	nil
Total 93,846		10,697

This was an increase of 18,710 arrivals on last year's figures. Once again the heaviest traffic passed through Manama Jetty and also the largest number without vaccination certificates. This traffic was mostly local, coming from neighbouring Gulf ports by launch and dhow and necessitated a strict watch, but no quarantine measure other than vaccination was necessary.

Muharrag Airport still lacks adequate control arrangements for the segregation of passengers from the general public until they have passed through quarantine. To assist in this matter, a separate enclosure has now been provided for non-passengers, but due to lack of organisation it has not achieved its purpose.

The number of arrivals at Muharrag Jetty was small but important in that so many of them did not possess the necessary vaccination certificates.

Neither of the two remaining places of entry at Sitra presented any difficulty.

It was not necessary to place any person, ship or aircraft in quarantine and no case of quarantinable disease occurred during the year.

Medical attention was afforded to 1701 members of ships' crews, 1,258 attending the Port Health Dispensary at Sitra and the remaining 443 at the Public Health Dispensary in Manama. The Bahrain Government Hospital provided hospitalisation facilities and sick personnel from overseas tankers were accommodated in the Bahrain Petroleum Company's hospital. There were 36 heat cases with two deaths, otherwise illnesses were of a routine nature. Attention was again drawn to the inadequacy of arrangements on board many ships plying in the Persian Gulf in respect of insufficient supplies of cold drinking water, medicines, salt tablets, refrigeration, ventilation and air-conditioning facilities.

The Mecca Pilgrimage of the year 1372 Hegira (A.D. 1953). It is estimated that 2,578 pilgrims passed through Bahrain. All came by air, and a transit camp was established at the Airport. There was no case of infectious disease and all possessed the necessary certificates of vaccination against small-pox and cholera.

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Bahrain Port Health Regulations 1952 were drawn up in accordance with International Sanitary Regulations and were put into effect during the year.

Number of Ships granted Practique

After Boarding	..	..	..	..	..	352
Without Boarding	..	..	..	..	..	1179
Total	..	..	..	..	..	1531

Number of Passengers, Crews and Launches arriving at Bahrain.

Manama Jetty	..	..	..	..	..	1558
Muharrag Jetty	..	..	..	..	..	157
P.C.L. Jetty, Sitra	..	..	..	..	..	152
Total	..	..	..	..	..	1867

Number of Passenger Aircraft arriving at Muharrag Airport

4348

Number of Aircraft, Ships or other vessels placed in Quarantine

nil

Number of Deratization Exemption Certificates issued

30

Number of Vaccinations and Inoculations carried out against:

Smallpox	..	..	..	..	..	25,040
Cholera	..	..	..	..	..	3,698
Etiatic Group	..	..	..	..	..	680
Yellow Fever	..	..	..	..	..	129
Typhus	..	..	..	..	..	120
Plague	..	..	..	..	..	104

632 Until 1948 the Government paid Rs 48,000/- per annum to municipal funds, and the municipality paid Rs 24,000/- to the Government towards public protection.

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491 Municipal
Achievements.

Manamah. It is in Manamah that the work of the municipality is most conspicuous, partly because Manamah Municipality has had more money to spend and has existed for longer than the Muharraq Municipality.

Roads.

The most noticeable work in Manamah during the last few years is the construction of roads and the widening of streets in the bazaar area. Ten years ago there were very few parts of the bazaar which could be reached in a car, and even the most important shops were situated in narrow lanes. Now most of the principal bazaar are accessible to cars. The wider streets, which are in some places permanently roofed, are more healthy and sanitary and are easier to keep clean. The style of building has changed: people are no longer contented with low, dark shops, but build high, airy showrooms with windows in which their goods can be displayed. Although the first people to see this fashion were foreign shop-keepers, their example was very soon followed by the local traders, especially as, during the last two years, rents of good shops and offices, as well as houses, have risen considerably.

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312 Conservancy,
Sanitation, Water
Supply, Malaria.

For many years a municipal contractor was employed to clean the town; his work was satisfactory in the conspicuous parts of the bazaar and town, but not satisfactory in the back quarters of Manamah. The municipality now does the work itself, with more successful results. On the whole, the town is very clean and free from smells. One of the greatest problems which the municipality has to deal with is the reclamation of low ground behind the town, where water lies stagnant after the rainy season for many months. Originally the people of Manamah dug mud from this site for building houses, and now a large area of ground is only a few feet above sea level, so low that all attempts to drain the water into the sea have proved unsuccessful. During the last two years, special grants of Rs 10,000/- have been made by the Government to the municipality for filling this ground. The work is not yet complete.

Until a few years ago sanitation in Manamah consisted of cesspits in every house, which were emptied once or twice a year. The system was satisfactory; the municipal inspectors reported any leaking drains or insufficiently covered cesspits. Lately, however, many householders have installed a water supply, and an attempt at modern sanitation. In the case of houses on reclaimed land and near the sea, the drains flow into the sea, but the drainage conditions of houses distant from the sea is not satisfactory. A sewer which was built from the Municipal Garden to the sea, at the cost of over Rs 7,000/-, has not proved a success owing to the small difference in level between the garden and the sea, and drains which empty into this sewer have flowed backwards. At the time of writing, work is being done on the sewer, and it is hoped that it will eventually serve its intended purpose.

The water supply in Manamah now consists of a number of artesian wells, some of which are private property, others having been made by the Government. The Government and the municipality have issued regulations to prevent waste of water and the collection of stagnant water where mosquitoes will breed; these regulations are effective in the town. During certain months of the year, in the spring and summer, there are a great many mosquitoes in Manamah and Muharraq. It has, I think, been proved that the main mosquito-breeding place is inside houses in the large earthenware water jars which are kept in every compound, usually in a dark corner under a shed. They are never emptied, but are refilled when the supply gets low. Until now the municipal council and the public have strongly opposed all suggestions that the water jars should be inspected. In Rafas and Sakhir there are always quantities of mosquitoes, and these places are many miles from any gardens or water, which is an additional proof that the mosquitoes breed inside the houses. The municipalities spray oil on all standing water and take all possible steps to deal with breeding places which are not inside houses, but their officials have no authority to enter houses and inspect them.

At a future time it will be necessary to consider installing a regular town water supply, and possibly a drainage system as well. It is possible that a water system with a tap in every house would obviate the need of water jars and reduce the number of mosquitoes.

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The municipalities are valuable vehicles for carrying out sanitary and health measures among the public. It is easier to introduce unpopular rules, such as anti-malaria regulations, through the municipalities than by direct Government action.

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Fire In several parts of the town there are quantities of herani houses made of palm branches; these buildings are very inflammable. When fires occur in these neighbourhoods the flames spread rapidly. The Manamah Municipality some years ago built fire stations in various parts of the town, equipped with a fire bell and tins of sand for use in emergency. The storing of more than a certain number of tins of petrol and paraffin inside the town was also forbidden, and for this reason the Anglo-Persian Oil Company were given a piece of ground on the sea shore beyond Manamah, on which they built an oil and petrol store. The Government has now ordered a fire engine from England, and when this arrives, valves will be fixed on to the artesian wells in the town so that the engine can fill from any well. The fire engine will be in charge of the police, and will be kept at the Fort.

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Markets and Food Regulations. During the last ten years the municipality has greatly improved the conditions under which food is sold in the bazaar. Animals used to be slaughtered in the town opposite the Municipal Building, and the meat was sold under filthy conditions in a line of palm branch shops whose mud floors were never clean. The monopoly for the meat market and the slaughter-house was in the hands of Shaikh Sulman bin Shaikh Hamad. The municipality, in 1946, built a slaughter-house on the shore at Komaibia, actually in the sea, connected to the shore by a pier; and by means of an arrangement with Shaikh Sulman a proper stone meat market was built adjoining the Municipal Building. The municipality eventually, with the assistance of the Government, purchased Shaikh Sulman's rights over the slaughter-house, which is now a municipal concern. The negotiations, unfortunately, caused considerable ill-feeling, but the final results were satisfactory.

In 1931 a fish market was built, and during the present year three large steel markets have been erected by His Highness on his own property in the Suk al Arba, which are to be used as vegetable, lucerne, and fruit markets. These buildings, and a number of new stone shops, occupy a site which previously contained herani buildings. After a serious fire at the end of 1936, the whole of the area was laid bare, and it was then possible to rebuild the markets, replacing straw shelters with stone shops and steel buildings.

Many regulations have been passed by the municipality affecting foodstuffs; dried fish, which has an evil smell, can only be sold in a certain area; the food sold in the hotels and coffee shops is regularly examined by municipal inspectors, who are also responsible for the cleanliness of soda factories. Other matters affecting food in which the municipality has shown an interest—sometimes a rather officious interest—are prevention of short-weight bread, use of soda, adulteration of real ghee with cheap vegetable ghee, short-weight rice, and also standardisation of weights and measures. During Ramadhan, the municipality buys a quantity of sheep and sells meat at cost price in order to assist the poor. Other charitable work which is done by the municipality is the payment of compensation to poor persons whose houses are destroyed in fires, and the burial of paupers.

Public Health Measures.

In 1931 the municipality opened a lunatic asylum, which was badly needed. It is under the supervision of the Quarantine Medical Officer. The inmates are men and women, and it usually contains about a dozen patients.

The need for a leper settlement has been often discussed by the council, but this has been postponed until the Government has its own medical officer. There are a number of lepers in Bahrain, especially in the country villages, and undoubtedly steps should be taken to segregate them. Foreign lepers, when they are discovered, are immediately sent home to their own countries.

Attempts to enforce compulsory vaccination have not yet succeeded, though the need for this is appreciated by many members of the council.

Both in Manamah and Muharraq there are municipal midwives—Indian—who also have free dispensaries and clinics for women and children. The Government has recently opened a second

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women's dispensary in Manamah, which is in charge of a midwife who was trained in Iraq and was for some years in the Basra Civil Hospital. The work done among the women is much appreciated and is, in my opinion, very valuable. Bahrain is notorious as being the one place in the Gulf where local midwives still administer a certain sort of treatment to women after childbirth which has the most disastrous effects on ensuing childbirth. It is hoped that the work of trained midwives will combat the local practice.

All stagnant water inside the municipal area is sprayed regularly with crude oil, which is provided free for the purpose by the Bahrain Petroleum Company.

Gardens, Cemeteries.

About thirteen years ago the Manamah municipality bought a large piece of ground inside the town for a municipal garden. Two years later an artesian well was drilled there and a quantity of trees, mostly obtained from Karachi, were planted in the garden. The trees are now very tall, and the garden is much frequented by the public, especially during the hot weather, when quantities of people go there in the afternoon and sit in the shade under the trees. Part of the ground has been made into a small zoological garden, and the Bahrain Sports Club, by arrangement with the municipality, has built two cement tennis courts, which are much used. It has been proposed regularly for the last four or five years in the municipal council that on one afternoon the garden should be set aside for women only. Every year the motion has been defeated, but each year by a smaller number of votes.

Two large cemeteries, formerly open on all sides, inside the town were surrounded by stone walls in 1930, which has done much to improve the appearance of the part of the town where they are situated. The tomb of Saikh Ahmed, the first Khalifah Shaikh of Bahrain, on the southern edge of the town, was repaired and walled at the same time.

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Muharrag Municipality.

The work of the Muharrag municipality is less conspicuous than that of Manamah. The most important work after town cleaning and road widening has been the filling in of what used to be a noisome creek which reached from the shore almost to the entrance of the bazaar. The reclaimed ground is valuable, and is now occupied by stalls and the taxi stand. The sea road on the north of the customs office was built by the municipality about eight years ago, with assistance of a special grant from the Government. The question of extending this road is now under consideration.

Opportunity for town planning is almost non-existent in Muharrag, as the town is surrounded on three sides by the sea and on the north much of the shore has always been flooded during high tides. The municipality has made some effort to preserve the low-lying land outside the town by building a long, low wall on the shore which keeps back the sea.

During the last two years the Muharrag municipality has carried out work in Hadd, where no municipality exists, widening the main road and filling in a long and very insanitary sewer. The Government made a special grant for this work, which was outside the province of the Muharrag municipality.

The town of Muharrag is very congested; there are no open spaces or public gardens as in Manamah, and the streets are too narrow for trees to be planted in them. For this reason it is difficult to improve the appearance of the place. Houses in Muharrag are old-fashioned in style and, except on the sea road, few of them are detached; the bazars do not contain any modern shops, and there are no public market buildings. For several years the commercial importance of Muharrag has been declining, though it is still a centre for pearl trading, as most of the biggest pearl merchants live there.

MUHARRAQ MUNICIPALITY

Year.	Revenue. R.	Expenditure. R.
1936	46,000/-	38,500/-
1937	62,900/-	59,600/-
1938	75,600/-	82,800/-

Bahrain M22
Saudi Arabia M31

THE ARAB AT HOME

000 were to be kept away from all food. That epidemic stopped as if it had been cut off with an ax. There was not another fresh case reported after that day.

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Bahrein is full of malaria. One of the city officials came to me not long ago to inquire as to the possibility of putting kerosene oil on the stagnant pools with which Bahrein abounds and so diminishing the amount of that disease. In matters like these the medical missionary has a most wonderful opportunity to be the pioneer in public health service. He hopes to see the day when all such work will be taken up by the governing sheikhs and carried to a point far beyond anything that he can do, but in the meantime helping to get such projects started is one of his keenest pleasures. He is also interested in the creation of an elementary medical literature for these backward communities. Simple pamphlets on malaria have found a wide reading in Basra, and a series of similar popular presentations of the dangers, means of transmission, and treatment of tuberculosis, syphilis, gonorrhea and malaria is projected for Bahrein. This is a work that often taxes the medical missionary to the utmost, for his literary abilities are not always of a high order and his available time is still less adequate, but it is something that he must do.

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Not the least charm of work in such a country as Arabia is the number of medical problems that invite investigation. We have, for instance, a large amount of tuberculosis in Arabia, especially in the nomad communities. In America probably seventy-five per cent of all tubercular infections are pulmonary, but in Arabia perhaps less than twenty-five per cent. Just what causes the difference it would be interesting to investigate. One is tempted to speculate on the possibility of Arabian tuber-

Pollution of the soil is common, although the practice is discouraged in the towns. 364
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FAUNA AND FLORA

Except for investigations relating to the anopheline vectors of malaria, few entomologic studies have been undertaken in Bahrain. Five species of anopheline mosquitoes have been identified—*Anopheles stephensi*, *A. culicifacies*, *A. sergenti*, *A. fluviatilis* and *A. pulcherrimus*. *A. stephensi* breeds in shallow wells, seepage pools, water storage tanks and irrigation ditches, and is responsible for a large part of the malaria transmission on the islands. While *A. culicifacies* is probably a vector in some localities, it is generally regarded as of minor importance. *A. gambiae* is not indigenous, but it is sometimes found on board dhows upon arrival in port. Species of *Culex* are widespread. However, no vectors of filariasis have been recorded locally. Species of *Aedes* are known to be present. 164
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A campaign for the control of malarial mosquitoes has been carried on by the government since 1939. Supplementary programs are conducted by the Bahrain Petroleum Company in the vicinity of its installations and throughout the southern half of Bahrain Island. The antilarval measures include the treatment of breeding places with oil or DDT preparations and the stocking of wells and drainage ditches with the larvivorous fish, *Gambusia*. The prevalence of anopheline mosquitoes reached minimal proportions in Manama by 1948, but was still extensive in the surrounding suburbs and date garden areas. The following year, the spraying of the marshes, rubbish dumps and gardens around the main towns and the residual spraying of the houses and the bazaars with DDT and Gammexane preparations were introduced for the suppression of both flies and mosquitoes. 744

Flies are abundant, although their numbers have been markedly reduced in the towns since the inauguration of the residual 136
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136 spraying campaign. The existing species
744 have not been determined: several are prob-
ably implicated in the spread of intestinal
and eye infections. All forms of human lice
are present. Numerous species of fleas occur,
including presumably *Xenopsylla cheopis*,
the usual vector of plague, which was fre-
quently epidemic in the past.

FOOD SANITATION

744 The sanitary supervision of the mar-
656 kets, coffee shops, bakeries and other prem-
ises where foods are prepared or sold is the
responsibility of the municipal authorities
in Manama and Muharraq. Little govern-
mental control has been attempted, but the
new public health division plans to develop
[439] inspection services. Most of the meat used
is imported, and is not subject to inspection
in Bahrain. There are slaughterhouses, how-
ever, in Manama and Muharraq which are
operated under the supervision of the mu-
234 nicipal officers. No regulations exist gov-
erning the sale of milk. It is obtained from
small herds of goats, and is often contami-
nated.

HEALTH SERVICES AND MEDICAL FACILITIES

HEALTH ORGANIZATIONS

744 The Public Health Department of the
Bahrain government is responsible for the
protection of the health of the inhabitants
and the enforcement of international quar-
antine regulations. It is administered by the
Chief Medical Officer, whose headquarters
are located at Manama. The department
743 came into being in 1936, when the govern-
744 ment hospital was erected, but, with the
exception of malaria control measures, its
functions were concerned primarily with the
operation of medical care facilities until its
744 reorganization in 1952. In that year, public
health services were developed within the
department, which now incorporates sepa-
rate curative and preventive divisions. The
port health authority, formerly under the
Indian Medical Services, was taken over by

744 the Bahrain government in 1948, and transferred to the Public Health Department in 1952. There are no local health services, but constituted municipal authorities in Manama, Muharraq and Hedd oversee the sanitation in their respective towns.

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6248 A quarantine medical officer is attached to the headquarters staff of the British Resident for the Persian Gulf at Bahrain. He advises with the different local governments and supervises the conduct of international quarantine regulations in the Persian Gulf area.

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743 The Board of Foreign Missions of the Reformed Church of America supports hospitals for men and women at Manama, and carries on an active medical program among the people of the islands. The Bahrain Petroleum Company maintains a hospital and dispensaries for the benefit of its Bahraini and other personnel, and co-operates with the government medical services in its mosquito control campaign. A Persian Gulf Medical Society was organized at Bahrain in 1945 for the interchange of information among the doctors in the region.

MEDICAL INSTITUTIONS

743 Hospitals and Dispensaries. In 1951, the government medical service operated 2 general hospitals at Manama—a hospital for men, with a capacity of 60 beds, and a separate unit for women with a capacity of 54 beds. It also maintained isolation hospitals for men and women, with 12 and 16 beds, respectively; a tuberculosis hospital for men with 13 beds; a mental hospital with accommodations for 25 men and women; and, on one of the islands, a quarantine hospital which had 20 permanent beds and facilities for expansion in case of need. Women's clinics were conducted at Muharraq and Hedd: the former had 16 beds for maternity cases and the latter, 3 beds. In addition to the clinic services connected with the general hospitals, dispensaries were established for men at Muharraq, Hedd, Sitra, Karzakkan and West Rafaa, and for women at East Rafaa,

164 typhoid A infections, a large proportion of which occur among nonresidents.

[136] Dysenteries. Both amebic and bacillary dysentery are widespread. The percentage of carriers of *Endamoeba histolytica* is believed to be high, but the relative infection rates in the general population are uncertain. Over 1,000 cases of "dysentery" were treated in government institutions in 1950. The cases among men patients registered in the government isolation hospital in the two years from November, 1948, through October, 1950, totaled 120 for the first year and 176 for the second. Amebiasis was diagnosed in 59 to 71 cases and bacillary dysentery in 56 to 67. Mixed infections were recorded in a few cases, while in the second year, 30 cases were classified as diarrhea. Laboratory confirmation is not attempted, except in hospital cases, and the results of bacteriologic examinations are incomplete in many instances. *Shigella paradysenteriae* (Flexner) predominates among the recognized infections, but Shiga, Schmitz, Sonne and Newcastle strains are encountered with considerable frequency. The health authorities anticipate a diminution in the prevalence of dysentery in Manama and Muharrag as a result of the fly control campaigns initiated in 1950.

Cholera. Cholera was formerly recurrent in the Persian Gulf ports, all of which are exposed to spread of the infection by coastwise traffic. Within recent years the rigorous application of quarantine measures has curtailed the number of outbreaks. Cholera has not appeared in Bahrain since the middle 1930s, when it was traced to the crew of a dhow visiting the port of Manama.

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136 Helminthiases. Infection with intestinal worms is almost universal. The rate of infection with *Ascaris lumbricoides* is estimated at 95 to 100 per cent. Heavy infections are encountered frequently, especially in children. Enterobiasis and trichuriasis are common. Taeniasis, caused by the beef tapeworm, *Taenia saginata*, is sometimes seen. A few cases of echinococcosis are treated in the local hospitals each year; the

was also believed to be high in many districts. The fatality rates among the hospitalized cases averaged 6 to 22 per cent. The disease subsided in the summer of 1950, and no cases were observed in 1951. 164
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Vaccination against smallpox is not compulsory, but the health authorities endeavor to promote it in the school population. In 1948-49, a house-to-house campaign was carried on in the infected sections of Manama, and vaccination centers were established in the outlying districts. Vaccination is required of travelers to Bahrain, and persons who arrive without valid certificates of immunization are vaccinated by the medical officers upon landing. 751
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Other Infections. Pneumonia is prevalent: a large proportion of the cases are probably bronchopneumonias. Measles, mumps and whooping cough are endemic, and often epidemic. Chickenpox and poliomyelitis are also endemic, but the reported cases are usually few in number. Meningococcus meningitis is sporadic, and occasional small outbreaks are recorded. 164

DISEASES SPREAD OR CONTRACTED CHIEFLY THROUGH CONTACT

Veneral Diseases. Venereal diseases constitute a major problem, due to the transitory nature of a large section of the population. Local medical authorities believe that the syphilitic infection rate approximates 60 to 70 per cent. Numerous mild nonvenereal infections are observed among children, although the familiar manifestations of congenital syphilis are relatively rare. Gonorrhea is widespread, but chancroid and lymphogranuloma venereum are of minor significance. Cases of venereal disease are treated at the isolation hospital and the various dispensaries.

Diseases of the Eyes. Eye infections are prominent throughout this region. Ignorance of the basic principles of hygiene and the prevalence of flies, as well as the irritating effects of sand and wind during the shamal seasons, are underlying factors in the spread of trachoma, conjunctivitis and 164
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other eye diseases. Trachoma is widely distributed, and estimates of prevalence range from 35 to 90 per cent, depending upon the locality. Trichiasis is frequent. The most serious effects are often observed among immigrants from Saudi Arabia, the Trucial Coast and Iran. In an average of over 1,200 men patients receiving medical or surgical ophthalmic treatment in the government hospital in each of the two years 1949-50, about 30 per cent were suffering from trichiasis. Special attention is given to the treatment of eye diseases in all the hospitals and dispensaries, and clinics are conducted in some of the boys' schools.

Diseases of the Skin. Mycotic infections of the skin are common, but the children appear to be relatively free from favus. In spite of the low standards of hygiene among the poorer inhabitants, scabies is seldom seen.

Leprosy. Although leprosy is present among the Baharna, it is rare in the Arab community. Cases are found on all the islands, probably with greatest frequency on Sitra. The severity of the infection seems to be decreasing, and the percentage of childhood cases in recent years has been low. The actual number of lepers in the indigenous population is uncertain: it was believed to be about 100 in 1951. No segregation is practiced, but lepers are forbidden to congregate and beg in the towns.

Other Infections. Sporadic cases of tetanus and of tetanus neonatorum occur occasionally. Rabies is not recorded at present.

DISEASES SPREAD BY ARTHROPODS

Malaria. Malaria was formerly one of the foremost disease hazards in Bahrain, but in recent years its importance has declined progressively with the expansion of the anopheline control program. The present morbidity is believed to be insignificant in comparison with that encountered before the inauguration of the government's anti-malaria campaign in 1939. Treatment statistics are of doubtful value, yet they are

164 occurred intermittently in the past, chiefly in Manama and Muharraq. The islands are exposed to the introduction of the disease from neighboring territories, but the enforcement of quarantine regulations has prevented its establishment for several decades.

Other Infections. Although a mild degree of louse infestation occurs among the inhabitants in some congested areas, louse-borne typhus is rarely, if ever, reported. Imported cases of cutaneous leishmaniasis, or Oriental sore, and filariasis are occasionally treated in the local medical institutions, but the insect vectors are not known to be present, and indigenous infections have not been recorded. Guinea worm infection is sometimes seen among persons from Iran, but it is not found in the resident population.

NUTRITIONAL DISEASES

146 The standards of nutrition have improved materially in the last few years. Under-
364 nutrition is common, but serious defects are
511 seen primarily among the inhabitants of outlying villages and the families of workers from the mainland. Poverty, traditional dietary customs and intestinal parasitism are contributory factors. Subclinical deficiencies in vitamin C are widespread, and scurvy is observed from time to time. Rickets is frequent among the children in the towns. Anemia is prevalent, and hemoglobin levels of 25 to 30 per cent are not unusual among the women.

SUMMARY

619 Bahrain is an independent sheikhdom
131 which consists of an archipelago of 5 main
282 islands situated in the Persian Gulf near the
315 coast of Arabia. It has long been famous as a pearl fishing center, and, since 1932, has enjoyed prosperity as an oil-producing area.
161 It has a heterogeneous population which
162 numbered 109,650 in 1950, including 18,471
175 foreigners. The people are predominantly of
184 mixed Arab and Persian origin, and about 96 per cent are Moslems.

Amebic and bacillary dysentery, tuberculosis, venereal diseases and trachoma are major disease problems. Malaria ranks among the principal diseases on the islands, but it is rapidly being brought under control in the towns and the oases. Typhoid fever, measles and whooping cough are endemic, and sometimes epidemic. Outbreaks of smallpox are frequent, and protective vaccination is not compulsory. Leprosy exists among certain population groups. Poliomyelitis and meningococcus meningitis are sporadic. Ancylostomiasis, leishmaniasis, schistosomiasis, filariasis and guinea-worm infection are observed occasionally in nonresidents, but are not indigenous. Outbreaks of cholera and plague formerly occurred every few years, but recently they have been suppressed by quarantine measures.

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